NON-PUBLIC?: N
ACCESSION #: 9401130094
LICENSEE EVENT REPORT (LER)

FACILITY NAME: EDWIN I. HATCH NUCLEAR PLANT - UNIT 1 PAGE: 1 OF 5

DOCKET NUMBER: 05000321

TITLE: LOSS OF FEEDWATER PUMP AND FAILURE OF RECIRC PUMP RUNBACK
CAUSE AUTOMATIC REACTOR SHUTDOWN
EVENT DATE: 12/07/93 LER #: 93-016-00 REPORT DATE: 01/06/94

OTHER FACILITIES INVOLVED: PLANT HATCH UNIT 2 DOCKET NO: 05000366

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: STEVEN B. TIPPS, NUCLEAR SAFETY AND COMPLIANCE MANAGER TELEPHONE: (912) 367-7851

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On 12/7/93 at 0602 EST, Unit 1 was in the Run mode at a power level of 2436 CMWT (100% rated thermal power). At that time, the unit automatically shut down on low reactor vessel water level caused by an automatic shutdown of the "A" Reactor Feedwater Pump (RFP) and a failure of the Reactor Recirculation pumps to run back to 44% speed per design. A Group 2 Primary Containment Isolation System (PCIS) signal on low reactor water level was also received, and the Group 2 Primary Containment Isolation Valves (PCIVs) closed as required. As water level decreased due to void collapse from the rapid reduction in power, the Group 5 PCIVs closed, the Unit 1 secondary containment isolated, the Unit 1 and Unit 2 Standby Gas Treatment systems initiated, the Recirculation pumps automatically shut down, and the High Pressure Coolant Injection and Reactor Core Isolation Cooling systems initiated

on low low reactor water level per design. The High Pressure Coolant Injection system did not inject to the vessel because its initiation signal cleared before the injection valve received all of its permissive signals to open. Water level decreased to a minimum of 50 inches below instrument zero (108 inches above the top of active fuel) before being recovered by the "B" RFP and the Reactor Core Isolation Cooling system. Water level was maintained greater than 24 inches above instrument zero with the "B" RFP.

The "A" RFP shut down due to a low RFP lube oil system pressure resulting from a loss of power to the "B" lube oil system pump. The supply breaker to the lube oil system pump inadvertently opened and de-energized the pump motor. The standby lube oil pump did not prevent the RFP trip due to pressure fluctuations in the oil header. The Recirculation system pumps did not run back due to a clogged sensing line which delayed a low RFP flow signal to the runback logic.

Corrective actions included testing the breaker, clearing the sensing line, reviewing the lube oil system response to a pump trip, replacing a pressure switch, and adding an automatic start signal to the lube oil pumps.

END OF ABSTRACT

PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor
Energy Industry Identification System codes are identified in the text as (EIIS Code XX).

DESCRIPTION OF EVENT

On 12/7/93 at 0602 EST, Unit 1 was in the Run mode at a power level of 2436 CMWT (100% rated thermal power). At that time, the "A" Reactor Feedwater Pump (RFP, EIIS Code SJ) automatically shut down due to low RFP lube oil system pressure. Reactor water level began to decrease from its normal level of 36 inches above instrument zero (194 inches above the top of active fuel), reaching 32 inches above instrument zero in nine seconds. The "B" RFP automatically increased speed in response to the decreasing water level. However, because one RFP does not have sufficient capacity to maintain water level at 100% power, the increased flow rate from this pump could not prevent level from continuing to decrease.

In order to reduce reactor power to the capacity of one RFP, the Reactor Recirculation system (EIIS Code AD) pumps are designed to automatically runback to 44% speed when one RFP trips and low reactor water level (32 inches above instrument zero) is reached. However, the pumps failed to run back as designed when reactor water level reached 32 inches above instrument zero. Consequently, power was not reduced to within the capacity of the operating RFP, and reactor water level continued to decrease. At 0602 EST, 22 seconds after the "A" RFP tripped, the reactor shut down automatically due to low water level (approximately 12.5 inches above instrument zero).

The Group 2 Primary Containment Isolation System (PCIS, EIIS Code JM) received an isolation signal on low reactor water level and the Group 2 Primary Containment Isolation Valves (PCIVs, EIIS Code JM) closed as required. As water level continued to decrease due to void collapse from the rapid reduction in power, the Group 5 PCIVs received an isolation signal and closed, isolating the Reactor Water Cleanup system (EIIS Code CE). The Unit 1 secondary containment isolated, the Unit 1 and Unit 2 Standby Gas Treatment systems (EIIS Code BH) initiated, the Reactor Recirculation pumps tripped, and the High Pressure Coolant Injection (HPCI, EIIS Code BJ) and Reactor Core Isolation Cooling systems (EIIS Code BN) initiated on low low reactor water level (approximately 35 inches below instrument zero) per design. The High Pressure Coolant Injection system, however, did not inject to the vessel because the "B" RFP increased water level above the low level initiation setpoint before the system's injection valve, 1E41-F006, received all of its permissive signals to open. The HPCI system, which functioned per design given the rapid recovery of water level, ran on minimum flow until manually removed from service.

Water level decreased to a minimum of 50 inches below instrument zero (108 inches above the top of active fuel). The "B" RFP and the Reactor Core Isolation Cooling system recovered water level to 35 inches above instrument zero within two minutes of the reactor shutdown. Thereafter, level was maintained greater than 24 inches above instrument zero with the "B" RFP (the Reactor Core Isolation Cooling system was manually removed from service about five minutes into the event).

Reactor pressure was controlled by the Turbine Bypass Valves (EIIS Code SO) and never exceeded its pre-event value of 992 psig. No Safety Relief Valves actuated, nor were any required to actuate, to control reactor pressure.

CAUSE OF THE EVENT

The "A" RFP shut down automatically due to low RFP lube oil system pressure resulting from a loss of power to the RFP's "B" lube oil system (EIIS Code SL) pump. The supply breaker to the motor control center (EIIS Code EC) powering the lube oil system pump opened for an unknown reason and de-energized the pump motor. The RFPs "A" (standby) lube oil pump automatically started on low lube oil pressure, but did not prevent pressure from dropping to the point at which the RFP will automatically shut down.

Through initial investigations into the loss of the feed pump, it was discovered that the setpoint for the pressure switch which automatically start the standby lube oil pump on low oil pressure had drifted down approximately 35 psig. However, further evaluation determined that this setpoint drift was probably not the main contributor to the loss of the feed pump. Although not conclusively determined, the cause of the automatic shutdown of the 'A' RFP is believed to be pressure fluctuations in the control oil header following the lube oil pump trip. The trip apparently caused a low pressure condition in the vicinity of the hydraulic trip valve, which is normally energized via oil pressure on the spring.

The Reactor Recirculation system pumps did not run back due to a clogged sensing line which delayed transmission of the low "A" RFP flow signal to the runback logic. The Reactor Recirculation system logic will cause both pumps to run back to the Number 2 Speed Limiter if reactor vessel water level is less than 32 inches above instrument zero and flow from either RFP is less than 20%. The low pressure sensing line to "A" RFP flow transmitter 1N34-N045 was found to be partially clogged by what appeared to be corrosion products (the sensing line is made of carbon steel) resulting in a delay of greater than 22 seconds in the flow transmitter sensing the low flow condition for the "A" RFP. With the flow transmitter's sensing line partially clogged, the logic did not receive the low flow signal from the 'A" RFP until some time after the reactor shutdown, i.e., at least 22 seconds after the shutdown of the "A" RFP. It appears that corrosion products were dislodged from the instrument tubing walls as a result of a small leak in the low pressure sensing line discovered and repaired in September 1993) and/or the weld repair of the leak. There was no evidence of corrosion products, foreign objects, or clogging in the high pressure sensing line to flow transmitter 1N34-N045 when it was flushed, although this line also is made of carbon steel.

REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

This report is required by 10 CFR 50.73(a)(2)(iv) because of the unplanned actuation of the Reactor Protection System (EIIS Code JC) and Engineered Safety Feature systems. Specifically, the automatic shutdown of the "A" RFP and a failure of the Reactor Recirculation pumps to run back to 44% speed resulted in an actuation of the Reactor Protection System and automatic reactor shutdown on low water level. A Group 2 PCIS signal on low reactor water level also was received and the Group 2 PCIVs closed as required. The Group 5 PCIVs closed, the Unit 1 secondary containment isolated, the Unit 1 and Unit 2 Standby Gas Treatment systems initiated, the Reactor Recirculation pumps automatically shut down, and the High Pressure Coolant Injection system initiated on low low reactor water level per design.

The Reactor Protection System provides timely protection against the onset and consequences of conditions that could threaten the integrity of the fuel barriers and the nuclear system process barrier. An automatic reactor shutdown initiated by a low water level condition protects the fuel by reducing the fission heat generation within the core.

The Reactor Recirculation system controls reactor power over a limited range by governing the coolant flow rate through the core. An increase in recirculation flow temporarily reduces the void content of the moderator by increasing the flow of coolant through the core. The additional neutron moderation increases the reactivity of the core which causes the reactor power level to increase. The increased steam generation rate increases the steam volume. i.e., voiding, in the core with a consequent negative reactivity effect. A new, higher steady state power level is then established. When recirculation flow is decreased, the reactor power level is reduced in the reverse manner.

The recirculation flow control system is equipped with two speed limiters. The Number 2 Speed Limiter limits the output signal of the master controller if reactor vessel water level is less than 32 inches above instrument zero and flow from either RFP is less than 20%. The limited output signal causes a reduction of each recirculation pump's speed to 44% so that the resultant reduced reactor power is within the capacity of one RFP. This action prevents a low reactor water level scram following the trip of one RFP.

In this event, the Reactor Recirculation pumps failed to run back to 44% when the "A" RFP tripped on low lube oil system pressure. As a result, power was not reduced to within the capacity of the remaining RFP and the unit automatically shut down on low reactor water level. All

Engineered Safety Feature systems functioned as designed to minimize the decrease in water level and to restore it to normal. It should be noted that the High Pressure Coolant Injection system initiated on low low water level as designed; however, it did not inject to the vessel. This is because the low water level condition cleared before the system's injection valve received all of its permissive signals to open. This was determined, albeit indirectly, by viewing the Safety Parameter Display System (SPDS, EIIS Code IQ) event tape. The system did function per design given the rapid recovery of water level. Water level was never less than 108 inches above the top of active fuel and was returned to normal within two minutes of the reactor shutdown.

Reactor pressure was controlled by the Turbine Bypass Valves (EIIS Code SO) and never exceeded its pre-event value of 992 psig. No Safety Relief Valves actuated, nor were any required to actuate, to control reactor pressure.

On the basis of the above analysis, it is concluded that this event had no adverse impact on nuclear safety. This analysis is applicable to all power levels.

CORRECTIVE ACTIONS

The supply breaker to the motor control center powering the lube oil system pump was inspected on 12/7/93 and 12/8/93 per Maintenance Work Order 1-93-5968 and the applicable section of plant preventive maintenance procedure 52PM-MEL-012-0S, "Low Voltage Switchgear Preventive Maintenance." The breaker, its trip device, and the loads powered by the motor control center fed by the breaker were investigated. All procedural checks and inspections of the breaker and its trip device were acceptable. No grounds or other faults were found on the loads powered by the motor control center. The current reading for each of these loads was within specifications.

The high pressure and low pressure sensing lines to RFP "A" flow transmitter 1N34-N045 were flushed on 12/8/93 per Maintenance Work Order 1-93-5990.

Concerning the failure of the standby lube oil pump to maintain adequate oil pressure:

1) The automatic start pressure switch for the standby lube oil pump was replaced.

2) Additionally, a design change was performed which will immediately start the standby lube oil pump on a loss of power to the running pump. It is believed that this will aid in maintaining adequate oil pressure in the header, but will not completely solve the problem.

3) The response of the lube oil system to a pump trip is being further investigated. It is expected that further testing on the system will have to be done to conclusively determine the problem.

ADDITIONAL INFORMATION

No systems other than those mentioned in this report were affected by this event.

No failed components caused or resulted from this event.

No previous similar events have been reported in the last two years in which a an automatic reactor shutdown occurred on a partial loss of feedwater flow concurrent with a failure of the Reactor Recirculation pumps to run back.

ATTACHMENT TO 9401130094 PAGE 1 OF 1

Georgia Power Company
40 Inverness Center Parkway
Post Office Box 1295
Birmingham, Alabama 35201
Telephone 205 877-7279

J. T. Beckham, Jr. Georgia Power
Vice President - Nuclear
Hatch Project the southern electric system

January 6, 1994

Docket No. 50-321 HL-4473

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Edwin I. Hatch Nuclear Plant - Unit 1
Licensee Event Report
Loss of Feedwater Pump and Failure of Recirculation Pump
Runback Results in Automatic Reactor Shutdown

Gentlemen:

In accordance with the requirements of 10 CFR 50.73(a) (2) (iv), Georgia Power Company is submitting the enclosed Licensee Event Report (LER) concerning a loss of a feedwater pump and a failure of the recirculation system runback which resulted in an automatic reactor shutdown on low reactor water level. This event occurred at Plant Hatch Unit 1.

Sincerely,

J. T. Beckham, Jr.

OCV/cr

Enclosure: LER 50-321/1993-016

cc: Georgia Power Company
Mr. H. L. Sumner, General Manager - Nuclear Plant
NORMS

U.S. Nuclear Regulatory Commission, Washington, D.C.
Mr. K. Jabbour, Licensing Project Manager - Hatch

U.S. Nuclear Regulatory Commission, Region II
Mr. S. D. Ebneter, Regional Administrator
Mr. L. D. Wert, Senior Resident Inspector - Hatch

*** END OF DOCUMENT ***